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ABSTRACT

This paper highlights issues in the identification of appropriate metacognitive learning strategies when working with students at-risk for school failure. These students typically require explicit instruction to learn skills. The acquisition and efficacy of metacognitive learning strategies is explored across the lifespan. An outline is provided of the development of metacognitive skills in young children, followed by early behavioral markers of potential metacognitive problems and guidelines for intervention. There are certain developmental characteristics of middle school students, or adolescents, that should have an impact on curricular decisions regarding metacognitive strategies. Cognitive psychological theory has the potential for understanding what is important in children's learning, and within cognitive psychology, metacognition has the potential to be significant to educators and their practice for children and adolescents. Adult learners also need metacognitive strategies, and those who lack them, as illustrated by the example of women university students with attention deficit hyperactivity disorder, are at a real disadvantage. Efficient learning involves metacognition that is the active control, coordination, and monitoring of learning processes and strategies. (Contains 44 references.) (SLD)

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Looking at Metacognitive Learning Strategies

Using a Developmental Lens

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Abstract

In this paper, we will highlight issues in the identification of appropriate metacognitive learning strategies when working with students at-risk for school failure. These students typically require explicit instruction to learn skills. We will explore the acquisition, and efficacy of metacognitive learning strategies across the lifespan.

Looking at Metacognitive Learning Strategies

Using a Developmental Lens

At-risk students demonstrate slow progress in acquiring academic skills (Gelzheiser & Clark, 1991). However, those at-risk students who are aware of their own learning strengths, have an internal locus of control and receive explicit learning strategy instruction increase their likelihood of learning success (Larose, Robertson, Roy & Legault, 1998). Learning strategies are no longer thought of primarily as resources in working with students with learning disabilities. Researchers have demonstrated that nonintellectual dispositions, including effective study behaviours, controlled exam anxiety, and positive faculty relationships, may improve the prediction of academic success beyond academic and intellectual dispositions (Larose, Robertson, Roy & Legault, 1998). The findings of Larose et al. suggest that adaptive academic behaviours increase the chances of success of traditional students as well as those of academically at-risk students. Nonintellectual factors have been shown to be relatively independent of intellectual factors. The authors explain that this relative independence may be due "more heavily on the ability to adapt to new learning situations and to apply intellectual assets than on the level of academic aptitude alone" (p. 290).

The use of learning strategies involves increasing the student's understanding and use of metacognitive skills. The three essential skills of metacognition that allow students to regulate thinking and learning are planning (how much time to give a task, what resources to gather), monitoring (awareness of 'how am I doing'—asking 'am I going too fast,' 'is this making sense') and evaluation (judgements about the processes and outcomes) (Woolfolk, 1998). Such skill building focuses on improving the student's

awareness and use of strategies that enhance learning; in essence, teaching students how to learn. Therefore, students who "learn to learn" are in a better position to learn new skills in the future (Mercer & Mercer, 1993).

Education is evolving toward instruction focused on learning about one's own learning rather than on the instruction of isolated facts and "memorization." Recent technological advances provide access to global information and the downloading of information in the stroke of a key. With the advent of instantaneous information, students benefit from guidance on how to critically evaluate information and how to organize information in a meaningful manner.

This "learning how to learn" approach, and knowing about one's own learning strengths and areas of need, may be as important as learning the content of a course. Students' awareness of how to study and the techniques they employ for reading and writing are critical factors for school success. For learners to problem-solve, be strategic and reflect on their learning process, they must have explicit instruction in metacognitive strategies (Butler, 1994). For successful learning to occur, the underlying processes must be made more explicit to the student over the course of instruction (Mulcahy, Short, & Andrews, 1991).

A life-span approach may be important in understanding metacognitive learning strategies and their role in academic achievement. This paper explores how recognizing the behavioural manifestations of learning difficulties throughout developmental process may guide teachers in implementing appropriate learning strategies with all students, particularly those at-risk of school failure.

Developmental and Educational Implications of Metacognitive Learning Strategies Over the Life Span

In this section the importance of continuity and explicit instruction in the teaching of metacognitive learning strategies throughout development is discussed. First, children in the primary and elementary grades will be presented. Second, an examination of middle years students will occur and finally, an exploration of the use of learning strategies by adult learners will be undertaken.

Primary/Elementary Children

This section provides an overview of the development of metacognitive skills in young children. Following this outline, early behavioral markers of potential metacognitive problems are provided as well as guidelines for intervention.

Children with learning disabilities and children who are disadvantaged often have difficulties learning in school. The result is often school failure. Recognizing this problem is only the first step, however finding a solution has not been easy. One way to approach such an onerous task is to start with a question, in this case "What enhances a child's learning?" Learning may be enhanced if the learner had increased knowledge and use of their own cognitive resources, a process referred to as metacognition (Garner, 1987).

In the broadest sense, metacognition is any knowledge or cognitive process that refers to, monitors, or controls any aspect of cognition. While initial research (Flavell, 1979) focused on developmental changes in children's cognition around memory, understanding and communication (now known as metamemory, metacomprehension and metacommunication), metacognition is now accepted as a domain-general aspect of

cognition. It is now understood as contributing to many aspects of cognition, including memory, attention, communication, problem solving and intelligence. There is a belief that metacognitive skills significantly influence cognitive performance (Moses and Baird, 1999). As such, the potential contributions to education are numerous.

Measurement or observation of metacognitive skills in pre-school children is difficult. Several factors may influence the presence or overt manifestations of metacognitive skills in young children. Pre-school children have some metacognitive abilities but noticeable growth in metacognitive skills occurs throughout development in adolescence and beyond. Flavell (1987) suggested that even two-year olds may have some limited metacognitive experiences, although they may not interpret or take advantage of them in the same way as older children or adults.

How metacognitive abilities develop is not precisely known but this development is believed to be multifaceted. Young children's metacognitive abilities may be limited by their ability to be introspective. Metacognition would encompass introspection or the way that people come to be attentively conscious of the mental state in which they are currently. Flavell (1993) questions whether children five and younger have introspective access to their mental states. Children at this age rely on behavioral cues and environmental stimulation to determine what people attend to and think about in their environment. Moses and Chandler (1992) suggest that a critical component in developing metacognitive skills in pre-schoolers is the development of a theory of mind (i.e. initial knowledge about the existence of the mind and mental states) which is usually well established by the end of the pre-school years.

Metacognitive skills provide the active control necessary for the processing of information (Alberta Education, 1996). One of the problems associated with children who are learning disabled or at-risk is their ability to process information, an ability that develops throughout the pre-school years. This ability can be affected by styles of parental communication that may be persistently non-descript and composed of thought fragments. As a result, the child's potential for cognitive growth is not maximized and indeed the child may experience cognitive confusion and disorientation. Relevant aspects of the child's environment are not presented in a consistent manner with clarity and explicitness the metacognitive process may be affected. The likelihood of information being made meaningful is reduced and subsequent retrieval of relevant stored information and the application of aspects of this information to new situations compromised. Reductions in these early learning experiences also have negative impacts on a child's overall ability to name, categorize and explain (Green, 1990).

Typically children are not identified as having difficulties in metacognition until they have displayed weak performance in an academic setting. However, the association between metacognitive abilities and enhanced cognitive performance make it a worthwhile endeavor to identify some of the earlier identifiable behaviors in children who display deficits in this area. One approach to this task would be to identify some of the early behaviors that are associated with later academic failure. The following behaviors are recommended by way of early identification of children who may have metacognitive difficulties:

- a. poor oral vocabulary scores that may later translate into difficulties in written language

- b. poor discrimination of sounds
- c. poor categorization skills
- d. difficulty with analysis of complex visual patterns
- e. difficulty with recall from stories
- f. difficulties in perceptual-motor representation

Following the early identification of possible metacognitive problems in young children, the next step would be to provide them with the appropriate strategies to enhance cognitive development. An implication for teaching is to teach children how to solve problems. This process involves teaching higher-order thinking. An ongoing problem in teaching higher-order thinking is the transfer and generalization of the newly learned problem-solving skills.

One can improve performance on problem-solving tasks when one is able to select the relevant information in a problem statement. However, many students with learning disabilities or disadvantaged backgrounds have limited abilities to clearly define what the problem is and then to realize that they may have within their repertoire the skills or information necessary to solve the problem. It is necessary to ensure when teaching metacognitive skills that the students experience a range of situations in which similar strategies would apply (i.e. they need a wide range of practice problems) so that they recognize their ability of identifying relevant data for problem solving. One way to do this is to ensure relational understanding of the 'why' in what they are doing. Children who are learning disabled demonstrate the ability to move through the stages of higher order thinking and benefit to the same degree as general education students from this same teaching approach (Niedelman, 1991).

Students who are learning disabled or at-risk are often more proficient in instrumental learning (knowing what to do) and not as proficient in relational learning (knowing why to do things). Relational understanding is required for flexibility and adaptation to new tasks. These children may have learned and can do many things however they do not know why they are doing them. In this sense, the learning experience or knowledge has not been made meaningful to them in a way that would allow them to adapt the information to novel situations. Metacognitive skills provide a roadmap from what is known to what is unknown.

Middle Years

Having looked at children and their experience of elementary school, the discussion will now turn to adolescents. The shift from elementary school to middle school is a significant event of early adolescence. This transition occurs at a time when most young adolescents are also experiencing the physical, psychological, and social changes associated with adolescence, including the new role demands presented by parents, peers and teachers. Moreover, the middle school environment is significantly different from that of elementary school. In elementary school, students are typically accustomed to spending the day with a single teacher in one classroom, and now in middle school find themselves locating numerous classrooms and encountering different teachers for each subject area. In middle school, students begin to focus on social popularity, academic prowess and athletic ability. Some students thrive in this new environment, others respond to these changes by withdrawing from competition in all areas. Many find themselves unable to adapt to the changing requirements and the new

academic demands. Those who do not succeed become discouraged, and their discouragement leads to further academic failure.

Adolescence ushers in a change in thinking that has gradually developed. This novel way of thinking includes a number of separate skills that began to develop several years earlier but initially are used only in isolation (Neimark, 1982). In adolescence, the thinking processes become coordinated and refined, allowing students to apply these processes generally. The end result is abstract thought. This change alters scientific reasoning, understanding of principles, grasp of society and introspection. One marker of adolescent thinking is the ability to monitor and regulate one's thinking and learning (Keating, 1990). Research findings have highlighted the importance of development in adolescence of their abilities to regulate learning (Sternberg & Powell, 1983). In the classroom context, the use of cognitive and self-regulatory strategies has been shown to be an important component of student performance and achievement (Pintrich & DeGroot, 1990; Zimmerman & Martinez-Pons, 1986). Students who do not use any strategies to help them encode information or rely only on rote rehearsal strategies seem to process the information at a more superficial level of learning (Weinstein & Mayer, 1986).

Research findings have consistently demonstrated that metacognitive control and self-regulatory strategies are important for learning (Brown, Branford, Campione, & Ferrara, 1983; Keating, 1990). Metacognition, according to Andrews and Lupart (2000) consists of two constructs. First, metacognition entails one's self-knowledge about learning in general, and one's own learning capabilities. This metacognitive knowledge refers to the learner's self-knowledge about his/her cognitive abilities and resources.

Metacognitive knowledge also encompasses knowledge of task variables. Further, metacognition consists of one's ability to independently control and regulate cognitive abilities such as planning, monitoring, and checking. This self-regulation is the notion that the thinking of infants and young children, which is initially guided or mediated by adults, becomes increasingly more autonomous and independently controlled as the child grows older. Thus, the learner is not simply a passive recipient of new knowledge, but rather is actively engaged in evaluating and guiding her/his own cognitive activity. In essence, the term 'metacognition' involves knowing what one knows and understanding what one needs to know in order to learn (Wallace & Miller, 1988).

Metacognitive knowledge includes everything students know and believe about the human mind and its activity (Flavell, 1985). This knowledge is generally stable, once acquired it is retained. Generally, it takes a long time to develop. Knowledge about cognition keeps developing into late adolescence and even into adulthood (Brown et al., 1983). Increasing proficiency as thinkers, problem-solvers, and readers reflect changes in executive management of thinking (Paris & Lindauer, 1982). The increasing knowledge or progress in cognition is not simply the result of age, but of experience, expertise, and social contexts that make discovery of these skills probable (Brown, 1980).

There are certain developmental characteristics of middle school students, or adolescents, that should impact curricular decisions regarding metacognitive strategies. Kaplan (1992) reported that learners must be active participants, small learning groups should be regularly employed, and strategies for learning should be taught, modeled, and re-taught as necessary. Reflecting developmental changes, adolescents should be encouraged to move around, work with others, and brainstorm with peers. Allowance

should be made for frequent changes of pace to experience interactive, positive and supportive classroom environments. The process of learning how to think critically and how to evaluate one's learning represents crucial skills that students must be taught and then practiced and mastered.

Regulating activities (planning, monitoring, testing, revising, and evaluating) are inconsistent and age-independent in their use in individuals (Wong, 1991). Self-monitoring is often an unconscious process, and therefore an unstable experience (Baker & Brown, 1984). Brown's work in metacognition and self-regulation has important implications for educators.

Throughout the past two decades, there has been a surge in research and practice aimed at the development and understanding of metacognitive skills. Central to the majority of the interventions aimed at developing metacognitive strategies are four elements (Reid et al., 1991). First, explicit and elaborated instruction about the goals of strategies and their task applicability is crucial. Second, feedback about efficiency of strategy use in task performance is necessary. Training in monitoring the degree of task achievement resulting from the use of the strategy is the third requirement. The fourth and final requisite is the identification of the strategies used during task performance along with statements of the reason for their use.

While many educators have made significant contributions to knowledge about how to facilitate the use of cognitive strategies, much of this work has focused on specific domains of strategic performance (Ellis, 1993). Although there are a few exceptions, the domains have been treated as separate entities, as if the strategies involved in approaching each domain were separate and distinctly different (Marfo, Branford,

Campione, & Ferrara, 1991). The majority of the programs are designed to be taught independent of content areas and seem to operate on the assumption that thinking should be taught as an exclusive subject area. This type of strategy instruction is ignoring a unified, underlying conceptual framework for strategy use, retention and transfer.

An educator's task in assisting students to develop metacognitive processes and strategies is vital. The educator must foster the student's abilities to be cognizant and apply general problem solving abilities to different situations. Through instruction students must be made aware of their own cognitive states and thought processes. Direct instruction on the nature of the task, self-monitoring and strategies utilized is essential. The educator's primary role is to develop a teaching methodology that increases the student's cognitive awareness, promotes self-regulation, and provides explicit instruction for focusing the student on pertinent characteristics of the task.

Researchers and educators are currently studying how to teach strategies most effectively in order to increase the likelihood that students will use strategies autonomously in a self-regulated fashion (Pressley, 1995). There is a common pedagogical perspective in the various models of instruction that are emerging on self-regulation. The metacognitive information about strategies, nonstrategic knowledge and appropriate motivational beliefs are communicated as strategies and taught (Deschler, Schumaker & Lenz, 1984). Such teaching is constructivist, the instructor explanations and modelling are the beginning of a process by which the students construct understanding of the strategy by using it (Pressley, Harris & Marks, 1992).

Current instructional practices appear to be embracing an approach to teaching effective strategies that are well suited to the actual tasks that are presented in the

learning environment. There seems to be a movement toward teaching only a few strategies at a time and teaching them with breadth and depth rather than providing instruction superficially on multiple strategies. These models of strategy instruction emphasize that students should be taught how to monitor how they are doing, how to check their performance to keep track of progress and how to make alterations to their strategy when required. Periodic checking of cognitive processes requires explicit modeling because most students fail to monitor performance adequately and consistently, or take corrective measures when problems are spotted (Schneider and Pressley, 1989). Modeling may take the form of explicit verbalization, implicit demonstration, and through overt verbalization.

Implications for Teaching

Cognitive psychology theory has potential for understanding what is important in children's learning. Within cognitive psychology, metacognition has the potential to be significant to educators and their practice. Important elements within metacognition suggest that an individual's self-knowledge of mental activity can cultivate a sense of executive self-control and self-mastery. The application of this concept to education suggests that acquisition of metacognitive knowledge by the child must be understood by both the educator and learner as being a controlled, exerting endeavor which requires continuous and conscious monitoring as well as persistence. Metacognition requires active involvement in the learning activity. Students need to become aware of their own thought processes. Educational interventions aimed at facilitating discussion of ideas, the development of knowledge concepts, strategies and cognitive style are necessary in the

continuous learning surrounding the students' knowledge about their own metacognitive state as well as variables affecting that state.

It is important to impart metacognitive information to educators and students because of the crucial role metacognition plays in the generalization and maintenance of learning strategies. To deploy strategies broadly and appropriately, students must possess knowledge about when and where strategies work best. Students are most likely to be motivated to use strategies if they are aware that strategic procedures enhance performance. Therefore, instruction should include explicit information about the utility of the strategies being taught. Furthermore, students should be taught that competent functioning is often a result of using appropriate, effective strategies rather than taking on an external locus of control or even "just trying hard." Students should be taught that they can become proficient thinkers by employing strategies used by successful learners.

Adult Learners

The previous sections examined metacognition in children and adolescents. This section focuses on adults at the post-secondary level and their use of metacognitive learning strategies. In particular, the experience of women university students diagnosed with Attention-Deficit/Hyperactivity Disorder will be presented to highlight the sense of being an adult who needs metacognitive skills but does not have them. In addition to the experience of metacognitive deficits, these women also offered some strategies that helped them.

Fleet, Goodchild, and Zajchowski (1990) pointed out that most students go to college and university as "natural" learners, not thinking about the learning process as they "just do it" and do it well. Without direct instruction, these students have "picked

up' learning strategies, often even unaware that they are using such strategies. O'Day (1990) pointed out that university professors are not trained as teachers so students have to work harder to learn from some of these instructors. As well, the demands of post-secondary institutions are quite different from those of high school.

Brinckerhoff, Shaw, and McGuire (1992) compared and contrasted high school with post-secondary settings and described the major differences. The amount of classroom instructional time differs in college and university settings as the instructional time is typically twelve-fifteen hours per week, in contrast to twenty-five to thirty hours in high school. Changing instruction time implies a greater emphasis on independent reading and studying time. Another difference is that professors expect a higher level of academic proficiency than acceptable in high school. Third, universities and colleges emphasize student responsibility in decision-making. A fourth difference is that students are expected to function autonomously. Students must gather information independently from numerous sources, including class notes, texts, and library reference material. They must work on semester assignments and projects and balance personal freedom with the need to set goals. The authors explained that these differing demands imply the need to use a broader array of learning and study strategies to achieve success. Under-preparedness and limited awareness of post-secondary expectations may make the difference between high school and university/college more difficult and success less likely.

Learning styles are approaches to learning and studying (Woolfolk, Winne, & Perry, 2000). While many different learning styles have been described, one factor common to most is differences between deep and surface approaches to processing information in

learning situations (Woolfolk et al., 2000). While learning preferences are often called learning styles, preferences is probably a more accurate label, as students have preferences for particular learning environments (e.g., where, when, with whom, or with what lighting, and noise levels) (Woolfolk et al., 2000). For example, results of a survey of adult learning style preferences, Zhang (1994) found that younger adults scored higher on (preferred) supervision and lower on class participation, while older adults scored lower on supervision and higher on class participation.

Sometimes students prefer to learn in a certain way because they have no alternatives (Woolfolk, Winne, & Perry, 2000). For this reason, Specht, Wood, Willoughby, and Bourdreau (1999) emphasize the importance of encouraging students' development of a wide array of metacognitive strategies. When students have a range of effective strategies available to them, they are better able to select the procedure that will best match the task demands and their skills.

For example, research on *elaborative interrogation* suggests that this strategy may be a useful addition to students' strategic repertoire (Specht, Wood, Willoughby, & Bourdreau). Similar to relational understanding previously discussed as being important for primary and elementary children, *elaborative interrogation* requires learners to answer *why* questions about information that they read. The effect of this strategy is specific to materials that access high background knowledge rather than low background knowledge (Willoughby, Motz & Wood, 1997). The researchers found that consistent with past research, elaborative interrogation was associated with greater memory performance than was repetition for both adolescents and young adults. Specht, Wood, Willoughby, and Bourdreau (1999) found that it was important that undergraduate

students be provided with support when they first encounter elaborative interrogation and other more complex metacognitive strategies. This support increases success when students execute and subsequently use the strategy. Recent research on metacognitive strategies focuses on the difficulty of transfer; students who learn strategies do not automatically apply them in schoolwork thereafter. Transfer does seem to be fostered by attention to issues of self-regulation during the learning of these strategies (Snow, Corno, & Jackson, 1996).

Self- and task-management within self-regulated learning (additional components of metacognition) involve rearranging task environments to make learning easier or more fun, seeking information/assistance from instructors or peers, and selecting the most important information to study for longer periods of time (Snow, Corno, & Jackson, 1996). These three self- and task-management factors (making learning fun, seeking assistance, and selecting important information) pose even greater difficulty for students with learning difficulties, or university students diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD).

Even though increasing numbers of students diagnosed with ADHD are entering colleges and universities (Richard, 1994), ADHD in this population is understudied (Weyandt, 1995). In a study of women university students diagnosed with ADHD (Corbin Dwyer, *in press*), the majority had not been diagnosed until adulthood. Reflecting on their university education, these women described being "robbed of time," never having enough time to accomplish the things required of them, including studying as much as they needed or wanted to, completing tasks, or organizing. One of the participants, Dagny, explained: "in my second year, my GPA dropped down because the

courses increased in difficulty so I didn't have as much time to cover the information."

Another participant, L.J., said the "noticeable impact [ADD] has is definitely on your study skills and your ability to organize and kind of put yourself on a timetable for things like papers...I end up studying the night before the exam...and...doing my paper the night before it's due." "I used to get really ticked off at people who used to...read the book three days before going in and they'd get 'A's and I'm thinking...how did you do that?'...I used to spend a lot of time doing this...I know I work harder than they do and that's very frustrating to me," expressed Christine. Michelle explained that she always submitted her first draft "because I never had enough time because time always gets away from me."

In trying to explain their disorder to professors, they did not always feel understood. Dagny: "I don't share [the diagnosis] with professors because in general...a lot of them don't know much about it, they don't understand it, and again would be 'you just need to work harder. It's an excuse.' That's how they see it."

Learning strategies for adult learners with learning difficulties may include compensatory supports (such as technical and external aids/accommodations) as well as metacognitive strategies (including study, memory, cognitive or spatial strategies) (Crux, 1991). Dagny explained "when you do look for help...you're looking for a way to, to not necessarily work less, but a way to do it more efficiently." Michelle had a friend who acts like a coach and helps her with paper writing by telling her "Ok, enough research, time to start organizing." Sue said, "In all my years of being busy...I have accumulated a lot of paper...I never have personal time to do my own sorting and filing at home." She enlisted the use of a coach. "I find I work extremely well when I've got somebody without ADD

helping me and we got a lot accomplished... someone bringing the focus back for me.” Help from other individuals, not all of them professionals in this area, can make a big difference in an adult with metacognitive deficits ability to complete tasks.

With regard to studying, the women use learning strategies, often discovered on their own, to remedy the time they did not have. Christine said “By reading [the text] out loud, that sort of brings me up equal with [my peers].” Sue described her strategy for getting started on a paper: “I have built into my school curriculum a time factor and when I know I have a project coming up, I make myself do studying for a test almost immediately. I make myself do the first page of an assignment immediately and then I can let it go for a few days. And that gives me a kick start and then I have no problem going back to it.” Specific strategies that address problem areas can help such adults feel and be successful.

Accommodations within the classroom are another way to help such students deal with ‘robbed time’. Christine explained: “that what I find I need, a little bit of extra time for exams because when you ask me a question, there’s no magical solutions to me...I’d say I have so many things that come up with me at the same time that it takes me *double* that time [than it takes someone without ADD].” The issue of accommodations are a little more complex as it takes the cooperation of other individuals. Peers question the ‘fairness’ of accommodations such as extra time. Extra time is not always viewed by other students as compensatory but as an unfair edge. However, by changing their environment, sometimes in a minor way, these women were able to achieve to their expectations.

In this study under discussion, the women spoke to the need for more effective communication between faculty and students and the need for more education, awareness and understanding of ADHD (and perhaps other learning difficulties) on the part of faculty and students, including those students diagnosed with the disorder. Nadeau (1998) recommended that adult students develop a relationship with their instructors, which includes informing the instructors about their learning difficulty *before* a problem arises. Often such students are assigned an academic advisor. She advises working closely with an advisor to choose courses each semester, carefully choosing the best periods to take more difficult subjects, and deciding how many courses to take.

A lot of post-secondary students, not only those with special needs, are shy and reluctant to ask for help, or do not fully understand what types of help they require. In addition, they are not aware of student support services on campus. Universities and colleges typically offer learning strategies workshops, such as test-taking, studying, and writing assistance. Are these services well advertised? Do students think that the services are only for a particular type of student? While these questions are not directly related to the use of metacognitive strategies at the post-secondary level, they are related to the learning of new, appropriate strategies.

The amount of education required by a person to pursue many vocational opportunities has increased steadily over the past one hundred years (Hill, 1996). Gardner, Jewler and Robb (1995) declared that while Canada sends a greater percentage of high school graduates to post-secondary institutions than do most other countries in the world, only about 50% of students graduate from their programs. Most students, between

30-40%, drop-out during and after their first year. Are post-secondary institutions meeting their needs or does the educational system need to start earlier?

Conclusion

Research suggests that nonintellectual dispositions, including study behaviours and controlled exam anxiety, may improve the prediction of academic success beyond academic and intellectual dispositions (Larose, Robertson, Roy & Legault, 1998). Efficient learning involves metacognition which is the active control, coordination, and monitoring of learning processes and strategies. When students have difficulty generating alternative approaches to solving a problem, or organizing, storing and retrieving information, they may have problems with metacognition (Alberta Education, Special Education Branch, 1996). By enhancing the learners' metacognitive functioning, students become more aware of their own thinking process. Research indicates that children who have been taught fundamental thinking, learning and problem-solving principles have become more effective academic and social learners (Haywood, Brooks & Burns, 1992). If metacognitive learning strategies are systematically introduced and reinforced throughout students' development, the likelihood of academic success may increase for all students, and especially for at-risk students.

In addition to metacognitive strategies, researchers have found positive effects of an individual's interest on their ability to attend to domain-specific materials. This was true for both child and adult populations (Willoughby, Motz & Wood, 1997). In their study of the impact of interest and strategy use on memory performance for children, adolescents and young adults in learning facts about animals, Willoughby et al. (1997) identified the importance of domain-specific interest for adolescent learners, in particular. Young

adults appear to be experienced in learning materials regardless of interest and children appear to be both interested and experienced in learning animal facts. Adolescents seem to require value for the topic to provide an "energizing factor to their learning" (p. 138), emphasizing the role of nonintellectual variables in their use of specific metacognitive strategies.

This discussion of metacognitive learning strategies is offered as a starting point for teachers to explore them as a teaching tool that may improve teaching practice. Teaching such strategies, coupled with appropriate developmental expectations, may maximize the educational experience of at-risk students in particular. "Indeed, the need to encourage students' development of strategic repertoires is a theme that has been evident in a wide body of literature for the past decade" (Specht et al., 1999, p. 180).

This paper explored the possible implications for examining metacognitive learning strategies through a developmental lens. By reflecting upon metacognition in a way not typically done, this reflection becomes a metacognitive strategy itself. Information is manipulated in ways not possible before. The power of metacognition is the choices for which it allows. By considering the implications of metacognition throughout development, teachers have more choice in instruction. By learning metacognitive strategies, students have more choice in the ways they learn and problem-solve. By exploring the life-span approach, educators have more choice in their consideration of the long-term outcomes of learning strategies.

References

- Alberta Education, Special Education Branch. (1996). Teaching students with learning disabilities. Edmonton, AB: Author.
- Andrews, J.W. & Lupart, J. (2000). The inclusive classroom: Educating exceptional children. Second Edition. Scarborough, Ontario: Nelson.
- Baker, L. & Brown, A. (1984) Metacognitive skills and reading. In P. Pearson (Ed.), Handbook of reading research. New York: Longman.
- Brinckerhoff, L. C., Shaw, S. F., & McGuire, J. M. (1992). Promoting access, accommodations, and independence for college students with learning disabilities. Journal of Learning Disabilities, 25(7), 417-429.
- Brown, A. (1980) Metacognitive development and reading. In R. Spiro, B. Bruce, and W. Brewer (Eds.), Theoretical issues in reading comprehension. Hillsdale, NJ: Erlbaum.
- Brown, A.L., Branford, J.K., Campione, J.C. & Ferrara, R.A. (1983) Learning, remembering and understanding. In J. Flavell & E. Markman (Eds.), Handbook of child psychology. Vol 3: New York: Wiley.
- Butler, D. (1994). From learning strategies to strategic learning: promoting self-regulated learning by post-secondary students with learning disabilities. Canadian Journal of Special Education, 9(4).
- Corbin Dwyer, S. (in press). Overcoming obstacles to education: The experience of women university students diagnosed with Attention-Deficit/Hyperactivity Disorder. The Canadian Journal of Higher Education.

Craig, G. J., Kermis, M. D., & Digdon, N. L. (1998). Children today: Canadian edition. Scarborough: Prentice Hall.

Crux, S. C. (1991). Learning strategies for adults: Compensations for learning disabilities. Toronto: Wall & Emerson.

Deschler, D., Schumaker, J., Lenz, B. & Ellis, E. (1984) academic and cognitive interventions for LD adolescents (Part 2). Journal of Learning Disabilities, 17 (3), 170-187.

Ellis, E. (1993) teaching strategy sameness for integrated formats. Journal of Learning Disabilities, 26 (7), 448-481.

Flavell, J.H. (1985) Cognitive development. 2nd Edition. Englewood Cliffs, NJ: Prentice-Hall.

Flavell, J.H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. American Psychologist, 34,906-911.

Flavell, J.H. (1987) Speculations about the nature and development of metacognition. In F.E. Weinert and R.H. Kluwe (Eds.), Metacognition, Motivation, and Understanding (pp. 21-29). Hillsdale, NJ: Erlbaum.

Flavell, J.H. (1993). Young Children's understanding of thinking and consciousness. Current Directions in Psychological Science, 2(2), 40-43.

Fleet, J. ., Goodchild, F., & Zajchowski, R. (1990). Learning for success. Skills and strategies for Canadian students. Toronto: Harcourt Brace Jovanovich.

Gardner, J. N., Jewler, A. J., & Robb, A. (1995). Your first-year experience: Success strategies for Canadian students. Toronto: Nelson Canada.

Gelzheiser, L. M., & Clark, D. B. (1991). Early reading and instruction. In B. Y. L. Wong (Ed.), Learning about learning disabilities (pp. 261-281). Toronto: Academic Press.

Green, R.J., (1990). Family communication and children's learning disabilities: Evidence for coles's theory of interactivity. Journal of Learning Disabilities, 23(3): 145-148.

Haywood, H. C., Brooks, P., & Burns, S. (1992). Bright start: Cognitive curriculum for young children. Watertown, MA: Charlesbridge Pub.

Hill, J. L. (1996). Promoting post-school educational opportunities for students with diverse needs. In J. Andrews (Ed.), Teaching students with diverse needs (pp. 275-306). Toronto: Nelson Canada.

Kaplan, Joseph. (1992). An interactive strategy for the instruction of critical thinking in the middle school. Florida: ERIC.

Keating, D. (1990) Adolescent thinking. In S.Feldman & G. Elliot (Eds.). At the threshold: The developing adolescent. Cambridge, MA: Harvard University Press.

Larose, S., Robertson, D. U., Roy, R., & Legault, F. (1998). Nonintellectual learning factors as determinants for success in college. Research in Higher Education, 39(3), 275-297.

Marfo, K., Mulcahy, R., Peat, D., Andrews, J. & Cho, S. (1991) Teaching cognitive strategies in the classroom: A content -based instructional model. In R. Mulcahy, R. Short & J. Andrews (Eds.). Enhancing learning and thinking. New York: Praeger.

Mercer, C. D., & Mercer, A. R. (1993). Teaching students with learning problems (4th Ed.). Toronto: Maxwell Macmillan Canada.

Moses, L.J. & Baird, J.A. (1999). Metacognition. In R.A. Wilson & F.C. Keil, (Eds.), The MIT Encyclopedia of the Cognitive Sciences (pp.533-535). Cambridge, MA: MIT Press.

Moses, L.J., & Chandler, M.J. (1994). Traveler's guide to children's theories of mind. Psychological Inquiry, 3, 286-301.

Mulcahy, R., Short, R. & Andrews, J. (1991). Teaching cognitive strategies in the classroom: a content - based instructional model. Enhancing learning and thinking. Praeger Publishers: New York.

Nadeau, K. (1998). Why is high school so ADD-unfriendly, and what can you do about it? [On-line]. Available: http://207.69.208.146/ld_indepth/add_adhd/hsunfriendly.htm

Neimark, Edward. (1982) Adolescent thought. In B.B. Wolman. (Ed): *Handbook of developmental psychology*. Englewood Cliffs, NJ: Prentice-Hall.

Niedelman, M. (1991). Problem Solving and Transfer. Journal of Learning Disabilities, 24(6), 321-384.

O'Day, D. H. (1990). How to succeed at university (2nd ed.). Toronto: Canadian Scholars' Press.

Paris, S.G. & Lindauer, B.K. (1982) The development of cognitive skills during childhood. In B. Wolman (Ed): Handbook of developmental psychology. Englewood Cliffs, NJ: Prentice-Hall.

Pintrich, P., & DeGroot, E. (1990). Motivational and self-regulated learning components of classroom academic performance. Journal of Educational Psychology, 82, 33-40.

Pressley, M., Harris, K.R., & Marks, M. (1992). But good strategy instructions are constructivists! Educational Psychology Review, 4, 3-31.

Reid, D., Hresko, W., & Swanson, H.L. (1991). A cognitive approach to learning disabilities. Austin, TX: Pro-Ed.

Roderick, M., & Camburn, E. (1999). Risk and recovery from course failure in the early years of high school. American Educational Research Journal, 36(2), 303-343.

Snow, R., Corno, L., & Jackson, D. (1996). Individual differences in affective and cognitive functions. In D. Berliner & R. Calfee (Eds.), Handbook of educational psychology (pp. 243-310). New York: Macmillan.

Specht, J. A., Wood, E. J., Willoughby, T., & Bourdreau, R. (1999). Evaluating the efficacy of elaborative strategies for remembering expository text. Alberta Journal of Educational Research, 45(2), 170-183.

Sternberg, R. & Powell, J. (1983). The development of intelligence. In J. Flavell & E. Markman (Eds), Handbook of child psychology: Vol 3: New York: Wiley.

Weinstein, C.E. & Mayer, R.E. (1986). The teaching of learning strategies. In M. Wittrock (Ed): Handbook of research on teaching. New York: Macmillan.

Willoughby, T., Motz, M., & Wood, E. (1997). The impact of interest and strategy use on memory performance for child, adolescent, and adult learners. The Alberta Journal of Educational Research, 43(2/3), 127-141.

- Wong, B. (1991). The relevance of metacognition to learning disabilities. In B. Wong (Ed): Learning about learning disabilities (pp. 231-258). San Diego, CA: Academic Press.
- Woolfolk, A. E. (1998). Educational psychology (7th ed.). Toronto: Allyn & Bacon.
- Zhang, L. (1994). Survey of adult learning styles. Unpublished master's thesis. University of Alberta, Edmonton, Alberta, Canada.
- Zimmerman, B. & Martinez-Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. American Educational Research Journal, 23, 614-628.